

**What is claimed is:**

1. An integrated bipolar plate module for a fuel cell stack comprising a plurality of cell units, each of which includes a membrane electrode assembly including an anode catalyst layer, a cathode catalyst layer, and a proton exchange membrane between the anode and cathode catalyst layers, the membrane electrode assembly further including an anode gas diffusion layer and a cathode gas diffusion layer adjacent to the anode catalyst layer and the cathode catalyst layer respectively, the integrated bipolar plate module comprising:
  - a cathode fluid flow plate, formed with a plurality of channels for conveying a cathode gas;
  - an anode fluid flow plate, formed with a plurality of channels for conveying an anode gas; and
  - a coolant fluid flow plate, which is mounted and sandwiched between the cathode fluid flow plate and the anode fluid flow plate, formed with a plurality of channels for conveying a coolant between the cathode fluid flow plate and the anode fluid flow plate;whereby every two adjacent cell units of the fuel cell stack are separated by a bipolar plate module so that the cathode gas is conveyed to an adjacent cathode gas diffusion layer through the channels of the cathode fluid flow plate and the anode gas is conveyed to an adjacent anode gas diffusion layer through the channels of the anode fluid flow plate respectively.
2. The integrated bipolar plate module as claimed in Claim 1, wherein the fuel cell stack further comprises a cathode collector and an anode collector forming on opposite sides of the fuel cell stack, and a cathode endplate and an anode endplate forming on opposite sides of the fuel cell stack.
3. The integrated bipolar plate module as claimed in Claim 1, wherein the

cathode fluid flow plate is formed with a plurality of parallel channels in a central portion thereof for conveying the cathode gas from an air inlet to an air outlet through the channels.

4. The integrated bipolar plate module as claimed in Claim 1, wherein the anode fluid flow plate is formed with a plurality of parallel channels in a central portion thereof for conveying the anode gas from a hydrogen gas inlet to a hydrogen gas outlet through the channels.
5. The integrated bipolar plate module as claimed in Claim 1, wherein the coolant fluid flow plate is formed with a plurality of parallel channels in a central portion thereof for conveying the coolant from a coolant inlet to a coolant outlet through the channels.